ALTERNATIVE FUEL REDUCTION METHODS IN BLUE MOUNTAIN DRY FORESTS: AN INTRODUCTION TO THE HUNGRY BOB PROJECT

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ABSTRACT

In Blue Mountain dry forests of Oregon and Washington, over 80 years of fire suppression and selective harvest of ponderosa pine have resulted in levels of fuels that have set the stage for uncharacteristically severe wildfire over much of the landscape. Forest managers recognize that restoration of these forests may require fuel reduction on a large scale. Although the tools currently used to reduce fuels—prescribed fire and thinning/removal—are well established, forest managers lack comparative knowledge on their economic feasibility and environmental effects. The goal of the proposed research at the Hungry Bob study site is to provide scientific information to forest managers on the interactions that shape the operational feasibility, economics, and environmental effects of alternative fuel reduction methods. Hungry Bob is also part of a proposed national network of fuel reduction studies (Fire-Fire Surrogate Network; Weatherspoon in press), in which the same experimental design (treatments, variables, plot sizes, sampling methods) will be applied to at least 10 other sites in the continental U. S., all featuring high risk of uncharacteristically severe wildfire.

INTRODUCTION

The dry mixed-conifer forests of the Blue Mountains (NE Oregon, SE Washington) are currently at risk. More than 80 years of fire suppression and selective logging of pine have resulted in excessive fuel and unusually high tree densities on many sites, increasing the probability of catastrophic wildfire over much of the landscape (Agee 1996). The current study (Hungry Bob) is designed to evaluate the ecological and economic consequences of alternative methods of treating fuels and standing stems, tools that are intended to reduce the risk of uncharacteristically severe wildfire.

The Hungry Bob study was motivated not only by scientific needs, but by social concerns. By the early 1990's, public concern for the forests of the Blue Mountains stimulated a flurry of "forest health" reports. Included among these are reports commissioned by two Regional Foresters (Gast et al. 1991; Caraher et al. 1992), two congressmen (Everett et al. 1994) and the Governor of Oregon (Johnson et al. 1995). Common among these reports is the call for managers to reduce fuel, particularly in the dry forest types of low to mid elevation. Because management has suppressed fires over several return intervals, it is these dry forests, dominated by ponderosa pine (*Pinus ponderosa*), that have changed most from pre-European conditions during the past 100 years.

If left alone, wildfires and other disturbance agents might eventually restore these dry forests to some semblance of their former structure, mediated by climatic events. But more than likely, society would not accept either the speed of such a recovery, or the pattern that natural disturbance would leave on the landscape. If we are to take an active management role in restoration, there is little doubt that fuel reduction will be required on a large scale. There is more doubt as to exactly how this should be accomplished. The two primary tools available to public land managers for manipulation of fuels are prescribed fire and mechanical treatment (rearrangement or thinning/removal). Each tool has significant advantages and disadvantages, in the social, economic, and biological realms. Yet despite the lack of knowledge on the economic and environmental tradeoffs associated with the application of these tools Forest Service managers feel compelled to move forward quickly in treating Blue Mountains forests. The Hungry Bob project aims to provide public land managers with comparative information on the efficacy of these tools for fuel reduction, stand density management, and ultimately, for a return to more historical ecological conditions.

STUDY AREA

The study area is part of the "Hungry Bob" fuel reduction project, on the Wallowa Valley District of the Wallowa-Whitman National Forest (Figure 1). Hungry Bob is located about 30 km north of Enterprise, Oregon, over a 50 km^2 area between Davis Creek on the west and Crow Creek on the east. Study units are situated primarily on ridge tops above steep valleys. Soils vary from shallow to deep, with many units having stands interspersed with scabby meadows. Ponderosa pine is the most common tree species in all study units, though most are classified as the Douglas- fir—snowberry plant association. The area has been intensively managed since the early 1900's, including fire suppression and harvest of most of the larger ponderosa pine throughout the period 1910-1996, and some prescribed underburning in the past 20 years. These activities have resulted in stands with basal areas averaging about 27 m^2/ha, comprised for the most part of stems less than 25 cm. At the present time, down woody fuels average about 22,000 kg/ha (about 10 tons per acre).

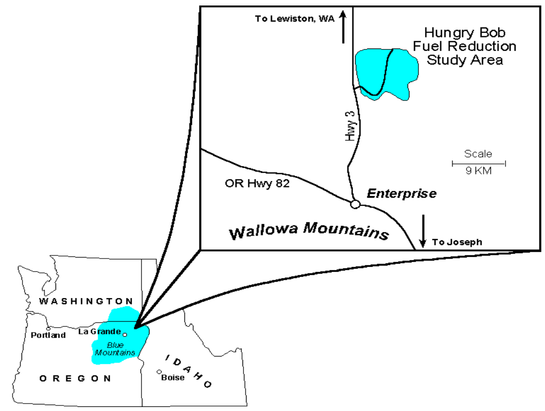

Figure 1. Location of the Hungry Bob Fuel Reduction Project.

RESEARCH DESIGN

The study is designed as an operational experiment, with four treatments replicated four times. Treatments were chosen to represent potential management choices for fuel reduction, and include thin, burn, thin and burn, and control (Figure 2).

Thinning was undertaken during the summer of 1998; prescribed fire will be applied in September or October 2000. Units average 10 ha in size (25 acres), and were each chosen and assigned randomly to one of the four treatment choices. A sampling grid of geo-referenced plot centers was established systematically within each unit and all variables were measured in reference to this grid. Variable types include operational economics, down fuel, stand structure (living and dead), residual stand damage, soils (physical, chemical, biological), litter arthropods, and bark beetle population dynamics. All environmental variables were measured pre-treatment, and will be measured several times post-treatment (1, 5 and 10 years post). Each variable will be analyzed separately and in combination.

The common sampling grid will allow the use of both ANOVA and regression to identify linkages among variables at the unit scale. For example, while fuel reduction may lower fire hazard and risk, removing down woody material may also reduce foraging habitat for birds and numerous macroinvertebrate species. Measuring both the extent of fuel reduction and its effect on components of biodiversity may help to identify thresholds that would be useful for fine-tuning management to achieve more holistic objectives.

In addition, measuring belowground variables within a fuel reduction context should help us better understand the interplay between rotting wood and the soil

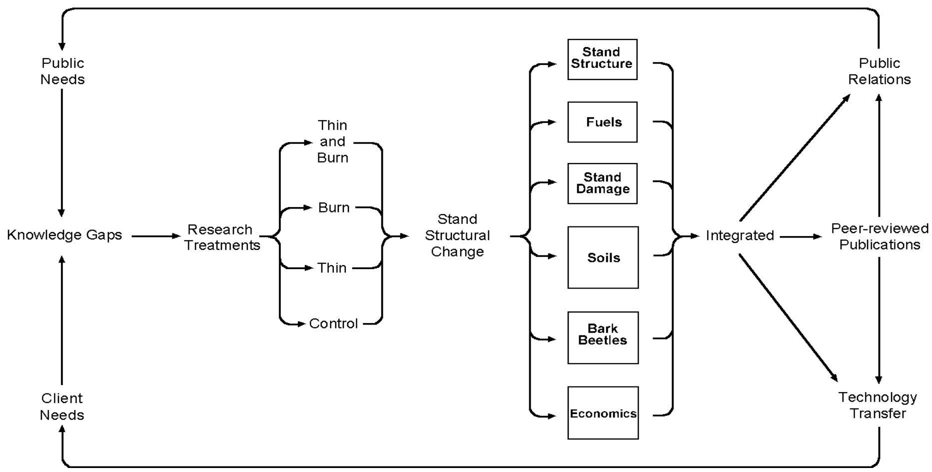

Figure 2. Research framework for Hungry Bob fuel reduction study.

environment. Because decomposing wood plays an important role in nutrient cycling, measuring the extent of fuel reduction, as well as soil chemistry and plant growth, should help identify ecological tradeoffs inherent in the application of management activities. Finally, since the Hungry Bob project will collect both ecological and economic data on common sites under similar conditions, managers will be able to assess tradeoffs between these two broad classes of information.

THE NATIONAL NETWORK

The perception among managers, scientists and policy makers that seasonally dry forests nation-wide are at increased risk is evidenced by widespread support of a proposed national network of fuel reduction studies (Weatherspoon, in press). This network, of which Hungry Bob is a part, will be composed of at least 10 primary sites in pine and oak-hickory forests nation-wide (Table 1).

SITE	CONTACT	LOCATION	FOREST TYPE
Mission Creek	James Agee, University of Washington, Seattle, WA	Wenatchee National Forest, central Washington	Mixed conifer: ponderosa pine, Douglas-fir, grand fir
Hungry Bob	James McIver, PNW Research Station, La Grande, OR	Wallowa-Whitman National Forest, northeastern Oregon	Dry mixed conifer: ponderosa pine, Douglas-fir
Lubrecht Forest	Carl Fiedler, University of Montana, Missoula, MT	Lubrecht Forest, western Montana	Dry mixed conifer: ponderosa pine, Douglas-fir
Klamath Province	Carl Skinner, Phil Weatherspoon, PSW Research Station, Redding, CA	Northwestern California	Dry mixed conifer: ponderosa pine, Douglas-fir, tanoak, pacific madrone
Kings District	Scott Stephens, Cal-Poly, San Luis Obispo, CA; Mark Smith, Sierra NF, Clovis, CA	Sierra National Forest, south central California	Mixed conifer: ponderosa pine, sugar pine, white fir, incense cedar, black oak
Sequoia-Kings Canyon (prescribed fire only)	Jon Keeley, Nate Stephenson, USGS	Sequoia National Park, south central California	Mixed conifer: ponderosa pine, sugar pine, white fir
Flagstaff	Carl Edminster, Rocky Mt. Research Station, Flagstaff, AZ	Coconino and Kaibab National Forests, north central Arizona	Ponderosa pine and gambel's oak
Jemez Mountains	Carl Edminster, Rocky Mt. Research Station, Flagstaff, AZ	Sante Fe National Forest, north central New Mexico	Mixed conifer: ponderosa pine, white pine, Douglas-fir, gambel oak, aspen
Ohio Hill Country	Daniel Yaussy, NE Research Station, Delaware, OH	Wayne National Forest, state and private lands, southern Ohio	Oak-hickory: various oaks, maples, yellow poplar
Southeastern Piedmont	Tom Waldrop, Southern Res. Stn., Clemson, SC	Clemson Experimental Forest, northwestern SC	Piedmont pine and pine-hardwood type
Florida Coastal Plain	Tom Waldrop, Southern Res. Stn., Clemson, SC	Myakka State Park, Sarasota, southwestern Florida	Longleaf and slash pine forest, palm and oak understory

Table 1. THE NATIONAL NETWORK: study sites, contacts, locations, and forest types.

Each participating site will apply the same four treatments (control, burn, thin and burn, thin) replicated at least three times, measure the same set of core response variables with a common plot design and over the same relative time period. Common experimental design among sites and sampling design within sites will allow three distinct and useful types of analysis in addition to the typical non-integrated, single discipline analysis: 1) integrated, multidisciplinary analyses among disciplines at the site scale (ANOVA, Regression); 2) integrated, single disciplinary analyses among sites (ANOVA); and 3) summary comparison of multidisciplinary results among sites (descriptive statistics). Because communication among sites will be facilitated by a network structure, participating scientists will gain perspective from other sites as they carry out their own site-specific work, and will be able to analyze their data within a richer context. Managers will also benefit, especially if repeatable patterns of results are observed where fire and fire surrogate treatments are applied nation-wide.

ACKNOWLEDGMENTS

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